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DANIEL J. BOURQUE, P.A.  
835 Hanover Street, Suite 303  
Manchester, New Hampshire 03104  
Telephone: (603) 623-5111  
Telecopier: (603) 624-1432

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BOX PATENT APPLICATION

Honorable Commissioner of Patents and Trademarks  
Washington, D.C. 20231

Date: December 1, 1998

Attorney Docket No.: TGI-003XX

JC542 U.S. PTO  
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Sir:

Transmitted herewith for filing is the **patent application** of:

**Inventor:** Gary R. Wolpert et al

**Entitled:** SECURITY DEVICE HAVING MULTIPLE SECURITY FEATURES AND METHOD OF MAKING SAME

Enclosed are:

- ☒ Declaration and Power of Attorney (without signature)
- ☐ An Assignment of the invention to:
- ☐ A Certified copy of a \_\_\_\_\_ application
- ☐ A Verified statement re small entity status (§1.9 and §1.27) - Small Business Concern (without signature)
- ☐ Citation of Art including \_\_\_\_\_ references
- ☒ 4 sheets of informal drawings (one set)
- ☒ Other: Letter Under 37 CFR 1.53
- ☐ Continuation-in-part application of application Serial No. \_\_\_\_\_, filed \_\_\_\_\_
- ☐ \_\_\_\_\_ is hereby appointed Associate Attorney by:  
Registration No.:

Attorney of Record: Daniel J. Bourque  
Registration No.: 35,457

CLAIMS FILED:	MINUS BASE:	EXTRA CLAIMS:	RATE:	BASIC FEE:
				\$790.00
Independent 6	- 3	=	x \$82.00 =	
Total 49	- 20	=	x \$22.00 =	
[ ] Multiple Dependent Claims (1st presentation)			+ \$270.00 =	
SUBTOTAL FILING FEE				
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**SUBMIT IN TRIPLICATE**

*Daniel J. Bourque*  
Attorney of Record: Daniel J. Bourque, Esquire  
Registration No. 35,457

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PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application : Gary R. Wolpert et al  
Filed : Herewith  
For : SECURITY DEVICE HAVING MULTIPLE SECURITY  
FEATURES AND METHOD OF MAKING SAME  
Attorney's Docket : TGI-003XX

Express Mail Mailing Number - EM593 269 771US  
Date of Deposit - 12/1/98

I hereby certify that the following items are being deposited with the United States Postal Service "Express Mail Post Office to Addressee" service under 37 CFR 1.10 on the date indicated above and as addressed to BOX PATENT APPLICATION, Commissioner of Patents and Trademarks, Washington, D.C. 20231:

U.S. Patent application of Gary R. Wolpert et al, entitled SECURITY DEVICE HAVING MULTIPLE SECURITY FEATURES AND METHOD OF MAKING SAME, consisting of

Specification includes:

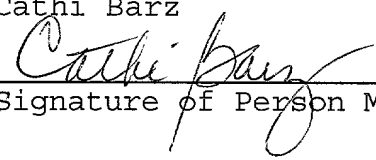
PP 1 through 24 of Detailed Description;  
PP 25 through 38 of claims 1 through 49; and  
PP 39 of Abstract

Drawings as follows (one copy informal): First sheet of Fig. 1, 2, 3A, 3B, 3C; Second sheet of Fig. 4A, 4B, 5; Third sheet of Fig. 6, 7; Fourth sheet of Fig. 8, 9, 10, 11.

A Declaration and Power of Attorney, unsigned, together with a cover letter in triplicate.

The above items are deposited with signatures and dated by the filing attorney as appropriate.

Cathi Barz

  
Signature of Person Mailing

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In re application : Gary R. Wolpert et al  
Filed : December 1, 1998  
For : SECURITY DEVICE HAVING MULTIPLE SECURITY  
FEATURES AND METHOD OF MAKING SAME  
Attorney's Docket : TGI-003XX

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Washington, D.C. 20231

Pursuant to Rule 37 CFR 1.53 the enclosed application is being filed without a signed oath or declaration for the purpose of obtaining a filing date. Upon notification by the United States Patent and Trademark Office, Applicants will submit an executed declaration and power within the period specified and pay the required fee(s).

Gary R. Wolpert et al

BOURQUE & ASSOCIATES, P.A.  
835 Hanover Street, Suite 303  
Manchester, New Hampshire 03104  
Telephone: (603) 623-5111  
Facsimile: (603) 624-1432

Enclosure

SECURITY DEVICE HAVING MULTIPLE SECURITY FEATURES AND  
METHOD OF MAKING SAME

RELATED APPLICATIONS

This application claims the benefit of U.S. Provisional  
Patent Application Serial No. 60/067,228 filed December 2, 1997,  
fully incorporated herein by reference.

FIELD OF THE INVENTION

The present invention relates to security devices and in  
particular, to a security device or element having multiple  
security features for use with valuable merchandise or items.

BACKGROUND OF THE INVENTION

Counterfeiting and tampering with secure documents or  
instruments, such as bank notes, checks, tickets, credit cards and  
the like, and other valuable merchandise or items is a common  
problem in many fields or enterprises. To prevent counterfeiting,  
many secure documents and other items of value include a security  
device or element, such as a security thread, disposed on or in  
the document. The security device typically includes one or more  
security features, such as metallic security features, magnetic  
security features, or luminescent security features, that  
authenticate the document and prevent counterfeiting and/or

1    tampering.

2           To authenticate the document, many conventional security  
 3    devices merely require that the existence of a single security  
 4    feature be detected. Thus, counterfeiters need only recognize the  
 5    security feature in a document or item and reproduce that one  
 6    security feature in a counterfeit document or item such that the  
 7    security feature is detectable to authenticate the counterfeit  
 8    document. Advances in technology have brought even new and easier  
 9    ways of identifying these security features and reproducing the  
 10   valuable documents or instruments with the security device. Thus,  
 11   a need exists for more covert security features that are not  
 12   easily identified and reproduced.

13           One type of security thread includes metallic features, such  
 14   as metallic graphic indicia, disposed on a carrier substrate.  
 15   According to conventional chemical etching techniques, a chemical  
 16   resist is printed on a metallic layer in the form of the graphical  
 17   indicia, either positively or negatively, and de-metalization of  
 18   the areas of the metallic layer not covered by the chemical resist  
 19   causes the graphic indicia to be formed either negatively or  
 20   positively by the remaining metallic layer. Security threads  
 21   having only a metallic security feature, formed according to this  
 22   method, do not provide adequate protection because the  
 23   counterfeiter can easily recognize and reproduce the metallic  
 24   graphic indicia.

25           Attempts have been made to combine multiple security  
 26   features, such as metallic and magnetic features, to make

1 counterfeiting more difficult. In one example, magnetic ink is  
2 used to print graphic indicia that can be read by MICR detectors.  
3 However, if magnetic ink is used to print graphic indicia on or  
4 with metallic security features, the magnetic features and  
5 metallic features are easily distinguishable and identified. A  
6 counterfeiter could recognize that both magnetic and metallic  
7 security features have been used and need to be reproduced.

8 Other types of security threads have also used hybrid metals  
9 or alloys to form graphic indicia having both magnetic and  
10 metallic security features. However, the hybrid metals and the  
11 process for depositing or applying the hybrid metals to form the  
12 graphic indicia is costly. Also, using hybrid metals limits the  
13 ability to vary the magnetic properties that can be used.

14 Accordingly, a need exists for a security device having  
15 multiple security features, such as metallic and magnetic security  
16 features, that are not easily distinguishable and recognizable  
17 upon observing the security device. A need also exists for a  
18 security device in which the security feature(s) is capable of  
19 providing machine readable encoded data, e.g., pertaining to the  
20 security device or document, in addition to detectable features  
21 for authentication of the security document. What is also needed  
22 is a method of making a magnetic/metallic security device using  
23 existing chemical etching or de-metalization techniques.



1 time.

2 In a further embodiment, the magnetic layer includes at  
 3 least first and second types of magnetic substances having at  
 4 least first and second predetermined magnetic characteristics  
 5 respectively. The first and second types of magnetic substances  
 6 are arranged in the magnetic layer in a predetermined pattern  
 7 representing data encoded with the magnetic layer such that the  
 8 first and second predetermined characteristics are detectable to  
 9 read the predetermined pattern and decode the data. In one  
 10 example, the first and second predetermined magnetic  
 11 characteristics represent binary integers, and the predetermined  
 12 pattern of the first and second types of magnetic substances  
 13 represents data in a binary coded format. One example of the  
 14 first and second types of magnetic substances include first and  
 15 second soft magnetic pigments having first and second  
 16 predetermined magnetic decay rates and/or predetermined levels of  
 17 magnetism.

18 The magnetic/metallic security device also has different  
 19 embodiments in which the metallic layer provides metallic security  
 20 features. In one embodiment, at least a portion of the metal  
 21 layer includes at least one predetermined characteristic that is  
 22 detectable, for authenticating an item having the security  
 23 device.

24 In another embodiment, the metal layer forms a plurality of  
 25 conductive regions on the substrate. The conductive regions are  
 26 separated by non-conductive regions and have at least two



different predetermined lengths forming a predetermined pattern for representing encoded data. The predetermined lengths of the conductive regions are detectable to read the predetermined pattern and decode the data. In one example, the conductive regions include first and second predetermined lengths representing binary integers, and the predetermined pattern of the first and second lengths of the conductive regions encodes the data in a binary coded format.

The present invention also features a magnetic security device for use with an item. The magnetic security device comprises a carrier substrate, and a plurality of magnetic regions disposed on the carrier substrate. The plurality of magnetic regions have different predetermined magnetic characteristics and are arranged in a predetermined pattern representing data encoded by the magnetic regions. The first and second predetermined characteristics are detectable to read the predetermined pattern and decode the data.

The present invention also features a metallic security device for use with an item. The metallic security device comprises a carrier substrate, and a plurality of conductive regions disposed on the carrier substrate. The conductive regions are separated by non-conductive regions and have at least two different predetermined lengths forming a predetermined pattern for representing encoded data. The predetermined lengths of the conductive regions are detectable to read the predetermined pattern and decode the data.

1       The present invention also features a method of making a  
 2 magnetic/metallic security device having a plurality of security  
 3 features. The method comprises: providing a carrier substrate  
 4 having first and second surfaces; applying a metallic layer to at  
 5 least a portion of the first surface of the carrier substrate;  
 6 applying a magnetic layer over at least a portion of the metallic  
 7 layer; and etching the magnetic layer and the metallic layer such  
 8 that the magnetic layer and the metallic layer are in  
 9 substantially identical registration and together form graphic  
 10 indicia on the carrier substrate.

11       The preferred method of making the magnetic/metallic  
 12 security device comprises: providing a carrier substrate having  
 13 first and second surfaces; applying a metallic layer to at least  
 14 a portion of the first surface of the carrier substrate; applying  
 15 a magnetic chemical resist to at least a portion of the metallic  
 16 layer, wherein the magnetic chemical resist forms a pattern of  
 17 graphic indicia on the metallic layer; and chemically etching the  
 18 metallic layer to remove exposed portions of the metallic layer,  
 19 wherein chemical etching is resisted by the magnetic chemical  
 20 resist such that the magnetic chemical resist and a portion of  
 21 the metallic layer underlying the magnetic chemical resist  
 22 together form the pattern of graphic indicia on the carrier  
 23 substrate. The method can also include applying an additional  
 24 layer over the graphical indicia formed by the magnetic chemical  
 25 resist and the portion of the metallic layer underlying the  
 26 magnetic chemical resist.

1  
2 DESCRIPTION OF THE DRAWINGS

3 These and other features and advantages of the present  
4 invention will be better understood by reading the following  
5 detailed description, taken together with the drawings wherein:

6 Fig. 1 is a top view of a document or item having a security  
7 device, according to the present invention;

8 Fig. 2 is an enlarged top view of a magnetic/metallic  
9 security device, according to one embodiment of the present  
10 invention;

11 Figs. 3A-3C are side, cross-sectional views of a method of  
12 making the magnetic/metallic security device, according to the  
13 present invention;

14 Fig. 4A is a top view of a magnetic/metallic security device  
15 having magnetic tracks, according to one embodiment of the present  
16 invention;

17 Fig. 4B is a schematic and graphical illustration of the  
18 magnetic/metallic security device having machine readable encoded  
19 magnetic and metallic security features, according to one  
20 embodiment of the present application;

21 Fig. 5 is a functional block diagram of a device for  
22 detecting or reading the magnetic security features, according to  
23 one embodiment of the present invention; and

24 Fig. 6 is a schematic illustration of a machine readable  
25 encoded metallic security feature, according to one embodiment the  
26 present invention;

Fig. 7 is a side cross-sectional view of the machine readable encoded metallic security feature and capacitive sensors, for reading the encoded data, according to one embodiment of the present invention;

Fig. 8 is an enlarged top view of a machine readable metallic security feature, according to another embodiment of the present invention;

Fig. 9 is an enlarged top view of a machine readable metallic security feature, according to a further embodiment of the present invention;

Fig. 10 is an enlarged view of a machine readable metallic security feature, according to yet another embodiment of the present invention; and

Fig. 11 is a schematic representation of a security instrument, according to one embodiment of the present invention.

#### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

A security device 10, Fig. 1, according to the present invention, is used with an item 12 to prevent counterfeiting or reproduction of the item 12 or another article to which the item 12 is attached. The security device 10 has multiple security features, such as metallic security features and magnetic security features, capable of being encoded with data in a machine readable format in addition to providing authentication of the item 12. The metallic and magnetic security features are preferably formed by using a magnetic chemical resist, as will be described in

greater detail below, such that at least some of the metallic and magnetic security features are generally perfectly superimposed and substantially indistinguishable by the naked eye.

The security device 10 can be used in secure documents including, but not limited to, banknotes, currencies, passports, visas, titles, licenses, registrations, checks, money orders, original documents, certificates of authority, event tickets and gift certificates. The security device 10 provides authentication of the secure document and/or is encoded with data pertaining to the secure document or the security device itself.

The security device 10 can also be used in labels, tags or packaging material including, but not limited to, pressure sensitive labels, glue-on labels, in-mold labels, heat-shrink labels, woven labels, tear tapes, shrink-caps and collars, and stickers. In this example, the magnetic/metallic security device 10 authenticates and/or is encoded with data relating to the articles to which the labels or packaging material is attached, such as liquor or other commodities of value.

The security device 10 can further be used with a laminated article including, but not limited to, passports, ID Cards, access cards, licenses, and credit/debit cards. In this example, the security device 10 is used to authenticate the laminated article and/or is encoded with data relating to the article or the owner of the article.

The security device 10 can also be used in tickets or passes including, but not limited to, event tickets, transit tickets,

lottery tickets, and admittance passes. According to this example, the security device 10 can provide authentication of the ticket or pass itself and/or can be encoded with data relevant to the event. The present invention also contemplates other uses and applications for the security device 10 to prevent counterfeiting, reproduction or otherwise provide security for items or articles of value.

According to the exemplary embodiment, the security device 10 is formed as a thread or strip that extends partially or entirely along the item 12 in any direction. The security device 10 can be embedded within the item 12, adhered to the item 12, woven in the item 12, or laminated between multiple layers of the item 12. The item 12 can also include multiple security devices 10 according to the present invention.

The security device 10, Fig. 2, includes a carrier substrate 14, for example, formed as a thread or strip. One type of carrier substrate 14 is made of a polyester, polyvinyl carbonate or polypropylene film on paper. Alternatively, the carrier substrate 14 can be a plastic film or metallized paper, or other type of material used in conventional security threads.

In the exemplary embodiment, the security device 10 includes graphic indicia 16 formed from a metallic/magnetic medium disposed on the carrier substrate 14. The graphic indicia 16 can be formed positively on the carrier substrate 14, i.e. the graphic indicia 16 is composed of the magnetic/metal medium. The graphic indicia 16 can also be formed in the reverse, i.e. the area 18 surrounding

the graphic indicia 16 is composed of the magnetic/metallic medium. The magnetic/metallic security device 10 can also be formed with a combination of positive and reverse graphic indicia 16. The graphic indicia 16 can be printed as line work in which solid areas are printed in the desired shape or as halftone in which tiny dots are printed with varying spacing to vary the shading. Although the graphic indicia 16 are shown as alphanumeric characters, the present invention contemplates any type of symbol, design, shape or other graphic indicia.

The method of making the exemplary security device 10, Figs. 3A and 3B, according to the present invention, includes first applying a metallic layer 20 to the carrier substrate 14. The metallic layer 20 preferably includes aluminum that has been sputtered or vapor deposited on the carrier substrate 14. Alternatively, the metallic layer 20 can be a metallic foil or other type of metal applied to the carrier substrate 14.

Next, a magnetic chemical resist 22 is applied to the metallic layer 20 according to the desired pattern of graphic indicia 16, e.g. printed in positive, reverse or both. The magnetic chemical resist 22 includes film-forming chemical resisting resins containing ferromagnetic and or other magnetic pigments. Examples of the chemical resist include, but are not limited to, solvent based, water based or solid based, ultra violet (UV) or electron beam (EB) polymerized resin systems or other conventional chemical resist resins. The magnetic pigments include both hard and soft magnetic pigments, as will be described

in greater detail below, typically ranging from about 200 oersteds to 10,000 oersteds.

An etching process is then performed on the magnetic/metallic security device 10, Fig. 3B, that removes portions of the metallic layer 20 that are not protected by the magnetic chemical resist 22. The etching process includes conventional chemical etching processes known to those of ordinary skill in the art. The magnetic chemical resist 22 resists the chemical attack and remains on the underlying metallic layer 20, arranged in the desired printed pattern. The magnetic chemical resist 22 is superimposed in substantially identical registration with at least a portion of the underlying metal layer 20, thereby providing both magnetic and metallic security features that are substantially indistinguishable in at least some areas of the security device 10. The magnetic chemical resist 22 thus acts both to resist chemical attack while etching the metallic layer 20 and to provide a magnetic security feature superimposed on the metallic security feature so as to be not easily identified.

Alternatively, the graphical indicia 16 can be formed using other types of techniques including, but not limited to, lasers, mechanical scribing, abrading, and the like. In one example, a substrate containing a metallic layer is over-coated with a magnetic layer and subjected to a laser etching process. The laser etching selectively removes both the magnetic and metallic layers and forms the desired graphical indicia 16 having the magnetic security feature superimposed substantially identically



1 over the metallic security feature.

2 The present invention also contemplates using an additional  
3 coating or laminate 24, Fig. 3C, over the graphic indicia 16, on  
4 one or both sides. In one example, the additional layer 24 is  
5 used to help hide the security device 10 when embedded in paper  
6 and viewed with reflected light. In this case, however, the  
7 graphic indicia 16 created with the magnetic chemical resist will  
8 remain observable when viewed in transmitted light.

9 The security device 10, Figs. 4A and 4B, can be encoded with  
10 machine readable analog or digital data as well as provide  
11 authentication in multiple ways by using the various properties of  
12 the metallic and magnetic security features. Using one or more  
13 metallic and/or magnetic properties to authenticate the security  
14 device 10 or item 12 involves detecting whether or not the one or  
15 more properties are present on the security device 10. Using the  
16 one or more metallic and/or magnetic properties to encode as  
17 analog or digital data involves detecting and reading a  
18 combination of properties that represents a numerical code, e.g.  
19 in Binary-Coded Decimal (BCD) format, and decoding the code to  
20 determine the data represented thereby.

21 The magnetic security feature is capable of authenticating an  
22 item or encoding data pertaining to the item in multiple ways. In  
23 one example, the graphic indicia 16 are formed as magnetic  
24 characters that can be read by conventional MICR detectors. In  
25 this example, the graphic indicia 16 is preferably formed as  
26 positive text.

According to another example, the magnetic chemical resist 22 includes a hard magnetic pigment that is capable of being magnetized in the same manner as a magnetic recording tape. In this example, graphic indicia 16, Fig. 4A, is preferably formed as reverse text such that the magnetic chemical resist 22 including the hard magnetic pigment forms one or more magnetic tracks 23a, 23b. Authenticating data or other information can be written to and read from the magnetic track(s) 23a, 23b using conventional recording devices and read using conventional readers.

According to a further example, the magnetic chemical resist 22 includes a soft magnetic that can be magnetized and holds a level of magnetism for a limited period of time depending upon the characteristics or properties of the soft magnetic. Using the soft magnetic allows the magnetic security feature to be further concealed because the magnetic properties will not be detected unless the soft magnetic is first magnetized. Soft magnetics typically have predetermined magnetic characteristics, such as a level of magnetism that they can achieve and rate of decay of magnetic charge. Soft magnetics can be used to provide authentication, by first magnetizing the magnetic/metallic security device 10 and then detecting the existence of the magnetic, the level of magnetism, or the rate of decay.

By providing soft magnetics with varying magnetic characteristics, such as different levels of magnetism which can be attained or rates of decay, the graphic indicia 16, Fig. 4B, can further be used to encode data in a machine readable format.

For example, the graphic indicia segments 16a-16d can include two types of soft magnetic pigments, one having a fast decay rate 28a and one having a slow decay rate 28b, that represent binary integers encoding data in BCD format. Some segments 16a, 16c of the graphic indicia are printed with magnetics having a fast decay rate and other segments 16b, 16d of the graphic indicia are printed with magnetics having a slow decay rate. Data is thereby encoded in BCD format (0101) by providing a predetermined pattern of segments 16a-16d having the two different types of magnetic pigments. The encoded data can include verification data or other data pertaining to the item 12.

According to one method of the present invention, different formulations of the magnetic chemical resist 22 having magnetic pigments with different magnetic properties or characteristics are printed onto the metallic layer 20 using multiple print stations, such as an offset printing press similar to the type used for multicolor printing. Using multiple print stations allows graphic indicia to be printed in any desired pattern using various combinations of magnetic chemical resists having various different magnetic properties.

The present invention also contemplates simultaneously using the level of magnetism and decay rate properties of the soft magnetics, as well as a mixture of hard and soft magnetics to achieve any desired combination of magnetic characteristics or properties for authenticating an item or encoding data pertaining to an item. Although the exemplary embodiment described above

1 refers to two different magnetic properties for encoding data in  
2 BCD format, any number of different properties can be used to  
3 encode data in other numerical formats. In addition to providing  
4 authentication and encoding data using the magnetic security  
5 features, the metallic security feature can also provide  
6 authentication and/or encode data, e.g., by forming the segments  
7 16a-16d with different lengths of metal representing data in BCD  
8 format (1100), as will be described in greater detail below.

9 The device 30, Fig. 5, used to read the magnetic/metallic  
10 security features includes at least a detector/reader 34 for  
11 detecting one or more characteristics of the metal and/or magnetic  
12 layers and/or for reading the predetermined pattern formed by the  
13 metal and magnetic regions having different characteristics.  
14 After detecting the one or more characteristics, an authenticator  
15 36 determines whether the security device is authentic. After  
16 reading the predetermined pattern, a decoder 38 decodes the data  
17 represented by the predetermined pattern.

18 When the security device 10 includes magnetic security  
19 features having soft magnetics, the device 30 further includes a  
20 magnetic charger 32 that charges the soft magnetic pigments prior  
21 to the reader 34 detecting the features of the magnetics, such as  
22 the existence of magnetics, the level of magnetization, the decay  
23 rate of the magnetic, or other detectable magnetic  
24 characteristics. Authentication can be made based upon whether  
25 the soft magnetic is present, whether the soft magnetic has a  
26 predetermined level of magnetization, or whether the soft magnetic

1 has a predetermined decay rate.

2       Decoding is performed by determining the pattern of the  
3 different magnetic characteristics read by the reader 34. For  
4 example, if the magnetic/metallic security device 10 shown in Fig.  
5 4 is magnetized with the magnetizer 32, after a period of time,  
6 the segments 16b, 16d having a slower decay rate 28b will remain  
7 magnetized while the segments 16a, 16c having a faster decay rate  
8 28a will no longer be magnetized. The reader 34 distinguishes the  
9 different magnetic properties and determines the predetermined  
10 pattern of magnetic properties. From the predetermined pattern of  
11 magnetic properties, the corresponding binary representation  
12 (0101) and the data represented thereby is decoded.

13       The metallic security feature 40, Fig. 6, according to one  
14 embodiment of the present invention, includes a plurality of  
15 conductive regions 42 and non-conductive regions 44, such as a  
16 metallized polyester film having demetalized breaks, for example,  
17 formed using the chemical resist process described above. Each  
18 non-conductive region 44 is disposed between two of the conductive  
19 regions 42. The plurality of conductive regions 42 and non-  
20 conductive regions 44 form a predetermined pattern that represents  
21 a verification code or data encoded with the metallic security  
22 feature 40.

23       Each conductive region 42 has one of at least two  
24 predetermined lengths, for example, long conductive regions 42a  
25 and short conductive regions 42b. Each predetermined length  
26 corresponds to a predetermined value so that the data can be

1 determined by detecting the length of each conductive region 42  
2 and determining a corresponding value.

3 In one example, long conductive regions 42a correspond to a  
4 "1" and the short conductive regions 42b corresponds to a "0".  
5 According to this example, the long and short conductive regions  
6 42a, 42b are used to encode data in BCD format. The long and  
7 short conductive regions 42a, 42b are arranged in a predetermined  
8 series corresponding to the binary representation of the data to  
9 be encoded. In this example, the detector/reader 34 detects the  
10 length of each conductive region 42 in the series (e.g. long or  
11 short) and determines the corresponding binary representation. To  
12 provide authentication, the binary representation will be matched  
13 to a predefined verification code for an item 12. To read encoded  
14 data, the binary representation will be further decoded.

15 Accordingly, depending upon the arrangement of the conductive  
16 regions 42 having varying lengths, a virtually unlimited number of  
17 verification codes or data can be encoded using the machine  
18 readable metallic security feature 40. The machine readable  
19 metallic security feature 40 according to the present invention  
20 allows encoded data to be easily varied by varying the sequence of  
21 the conductive regions 42a, 42b. The conductive regions can be  
22 formed according to various designs provided that they are  
23 conductive over one of the predetermined lengths, as will be  
24 described in greater detail below. Although only two lengths are  
25 discussed herein for simplification, the present invention  
26 contemplates using conductive regions of any number of different

1 lengths for encoding data. For example, octal data can be encoded  
2 using eight (8) different length conduction regions.

3 One method of reading and verifying the machine readable  
4 metallic security feature 40, Fig. 7, is by detecting the long and  
5 short conductive regions 42a, 42b using capacitive verification or  
6 detection, such as disclosed in U.S. Patent No. 5,419,424 issued  
7 to Harbaugh and incorporated herein by reference. According to  
8 capacitive verification methods, the machine readable metallic  
9 security feature 40 is positioned proximate capacitive sensors 50  
10 coupled to a verification device (not shown). When capacitive  
11 sensors 50 are positioned proximate conductive regions 42, the  
12 conductive regions 42 capacitively couple one sensor 52a to  
13 another sensor 52b. Where there is a non-conductive region 44 or  
14 "break" in the conductivity, there will be no capacitive coupling  
15 between the adjacent capacitive sensors 52b, 52c on either side of  
16 the non-conductive region 44. By detecting the changes in  
17 capacitance when the machine readable encoded metallic security  
18 feature 40 is positioned proximate the capacitive sensors 50, the  
19 presence of the long and short conductive regions 42a, 42b are  
20 effectively detected. The present invention also contemplates  
21 other verification devices and methods capable of detecting the  
22 lengths of the conductive regions 42a, 42b, such as various  
23 electromagnetic verification devices.

24 The conductive regions 42 of the machine readable encoded  
25 metallic security feature 40 are preferably formed from a metallic  
26 material, such as aluminum. Exemplary methods include, but are not

1 limited to, forming the conductive regions 42 by metalization of a  
2 polyester film, hot stamped foil, and printing the conductive  
3 regions 42 with a metallic ink. The present invention  
4 contemplates other types of metallic material and methods of  
5 forming the metallic conductive regions and non-conductive breaks.

6 The machine readable encoded metallic security feature 40 and  
7 the security device 10 in which it is used are preferably designed  
8 to allow minimal "stretching," for example, approximately 5% or  
9 less variation in length. Also, the detection of the lengths of  
10 the conductive regions 42a, 42b should account for the potential  
11 stretching of the security device and machine readable encoded  
12 metallic security feature 40, for example, by accounting for the  
13 potential percentage of change in length.

14 According to another embodiment of the machine readable  
15 encoded metallic security feature 40a, Fig. 8, of the present  
16 invention, each conductive region 42a, 42b includes indicia 46  
17 disposed thereon. Indicia 46 printed or disposed on the  
18 conductive regions 42a, 42b can be used for providing an  
19 additional verification code or data or can be used to provide  
20 false patterns that deceive the counterfeiter and hide the true  
21 verification code. Such indicia includes alpha-numeric characters  
22 46a, bar codes 46b, or other designs 46c. The indicia 46a-46c  
23 according to this embodiment is printed or disposed on the  
24 conductive regions 42a, 42b without breaking the conductivity of  
25 each conductive region 42a, 42b and without affecting the  
26 capacitive detection of the length of each conductive region 42a,



1 42b using capacitive sensors 52.

2 According to another embodiment of the machine readable  
3 encoded metallic security feature 40b, Fig. 9, the conductive  
4 regions 42 are formed as conductive indicia regions 62a-62c formed  
5 from a conductive material, for example, printed with metallic ink  
6 or formed with a chemical resist process. The conductive indicia  
7 regions 62a, 62c are established by having the individual  
8 characters or symbols 49a-49f of the indicia connected at contact  
9 points 48 and separated at the non-conductive regions 44. The  
10 conductive indicia regions 62a-62c thus have predetermined lengths  
11 and are arranged in predetermined patterns representing the  
12 encoded data to be detected, as discussed above. The conductive  
13 indicia regions 62a-62c include alpha-numeric characters as well  
14 as other symbols or characters used for providing an additional  
15 verification code or to provide false patterns that deceive the  
16 counterfeiter and hide the true encoded data.

17 A further embodiment of the machine readable encoded metallic  
18 security feature 40c, Fig. 10, of the present invention includes  
19 conductive regions 42a-42c, such as narrow regions of metallic  
20 material, and non-conductive indicia regions 64a-64c breaking the  
21 conductivity between the conductive regions 42a-42c. For example,  
22 specific alpha-numeric characters or other symbols can be formed  
23 of non-conductive material or by a chemical resist or demetalizing  
24 process between the conductive regions 42a-42c to provide the  
25 "break" in conductivity. The alpha-numeric characters or other  
26 symbols constituting the non-conductive indicia regions 64a-64c

further provide additional data or codes and false patterns that deceive the counterfeiter and hide the true encoded data.

The present invention contemplates using the magnetic security features and metallic security features alone or together on a security device. Any number of the magnetic or metallic properties described above can be used individually or combined with other properties to provide authentication of an item, encode data pertaining to an item, or both.

According to the various embodiments of the present invention, one or more security devices or threads 10, Fig. 11, can be provided in various locations on or embedded in a secure document or instrument 70. The one or more security devices 10 are also readable in various directions as well as right side up or upside down. In one example, the secure instrument 70 is formed by gluing the security device 10 between two half-weight layers of paper which are then laminated together. In this example, the security device 10 is preferably unlaminated so that any attempt to delaminate the instrument 70 and remove the security device 10 will cause the paper laminating adhesive to remove the metallic and/or magnetic security features and alter the security feature or encoded data.

One example of the instrument 70 is a ticket used for sporting events, concerts, theater, shows, lotteries, transportation, theme parks, fairs, and other events. The security device 10 in the ticket can be encoded with a predetermined authentication code or encoded data that can be read

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1 when the security instrument 70 is presented, e.g. upon admission  
2 to a particular event. In one example, one full code 72 appears  
3 in approximately 2.5 in.

4 Accordingly, the security device of the present invention  
5 authenticates an item and/or is encoded with data pertaining to  
6 the item in numerous ways with one or more security features, such  
7 as metallic security features and magnetic security features that  
8 generally appear together as one single security feature. The  
9 security features and encoded data are thus more difficult to  
10 identify and reproduce. The method of making the security device  
11 using chemical etching and a magnetic chemical resist results in a  
12 magnetic security feature that is substantially indistinguishable  
13 from a metallic security feature. The method of printing graphic  
14 indicia using a magnetic chemical resist also facilitates the use  
15 of magnetic pigments having different magnetic characteristics or  
16 properties by printing different formulations of the magnetic  
17 chemical resist.

18 Modifications and substitutions by one of ordinary skill in  
19 the art are considered to be within the scope of the present  
20 invention which is not to be limited except by the claims which  
21 follow.

22 What is claimed is:

CLAIMS

1        1.    A magnetic/metallic security device for use with an  
2    item    to    provide    multiple    security    features,    said  
3    magnetic/metallic security device comprising:

4        a carrier substrate;

5        a metallic layer disposed on at least a portion of said  
6    carrier substrate, for providing metallic security features; and

7        a magnetic layer disposed on and in substantially identical  
8    registration with said metallic layer, for providing magnetic  
9    security features, wherein said metallic layer and said magnetic  
10   layer together form visually identifiable graphic indicia on said  
11   at least a portion of said carrier substrate.

1        2.    The magnetic/metallic security device of claim 1,  
2    wherein said magnetic layer includes a chemical resist.

1        3.    The magnetic/metallic security device of claim 1,  
2    wherein said visually identifiable graphic indicia is formed as  
3    magnetic characters readable by MICR detectors.

1        4.    The magnetic/metallic security device of claim 1,  
2    wherein said magnetic layer includes a hard magnetic substance  
3    capable of being magnetized for recording data on said magnetic  
4    layer.



1           8. The magnetic/metallic security device of claim 7,  
2 wherein said first and second predetermined magnetic  
3 characteristics represent binary integers, and wherein said  
4 predetermined pattern of said first and second types of magnetic  
5 substances represents data in a binary coded format.

1           9. The magnetic/metallic security device of claim 7, wherein  
2 said first and second types of magnetic substances having said  
3 first and second predetermined magnetic characteristics include  
4 first and second soft magnetic pigments having first and second  
5 predetermined magnetic decay rates.

1           10. The magnetic/metallic security device of claim 7,  
2 wherein said first and second types of magnetic substances having  
3 said first and second predetermined magnetic characteristics  
4 include first and second soft magnetic pigments capable of  
5 holding first and second predetermined levels of magnetism.

1           11. The magnetic/metallic security device of claim 1,  
2 wherein at least a portion of said metal layer includes at least  
3 one predetermined characteristic, and wherein said at least one  
4 predetermined magnetic characteristic is detectable, for  
5 authenticating an item having said security device.

1           12. The magnetic/metallic security device of claim 1 wherein  
2 said metal layer forms a plurality of conductive regions on said



4 metallic layer underlying said magnetic layer.

1 17. The magnetic/metallic security device of claim 1,  
2 further including a coating layer disposed over said visually  
3 identifiable indicia formed by said metallic layer and said  
4 magnetic layer.

1 18. The magnetic/metallic security device of claim 17,  
2 wherein said visually identifiable indicia is hidden when viewed  
3 by reflected light and is observable when viewed by transmitted  
4 light.

1 19. The magnetic/metallic security device of claim 1,  
2 further including at least one magnetic track disposed along at  
3 least a portion of said substrate, for recording data.



1           20. A magnetic security device for use with an item, said  
2 magnetic security device comprising:  
3           a carrier substrate; and  
4           a plurality of magnetic regions disposed on said carrier  
5 substrate, wherein said plurality of magnetic regions have  
6 different predetermined magnetic characteristics, wherein said  
7 plurality of magnetic regions having different predetermined  
8 magnetic characteristics are arranged in a predetermined pattern  
9 representing data encoded by said magnetic regions such that said  
10 first and second predetermined characteristics are detectable to  
11 read said predetermined pattern and decode said data.

1           21. The magnetic security device of claim 20, wherein said  
2 different predetermined characteristics include at least first  
3 and second predetermined magnetic characteristics representing  
4 binary integers, and wherein said predetermined pattern of said  
5 magnetic regions having said first and second predetermined  
6 magnetic characteristics represents data in a binary coded  
7 format.

1           22. The magnetic security device of claim 20, wherein said  
2 magnetic regions having said different predetermined magnetic  
3 characteristics include at least first and second types of soft  
4 magnetic pigments having first and second predetermined magnetic  
5 decay rates.

1           23. The magnetic security device of claim 20, wherein said  
2 magnetic regions having said different predetermined magnetic  
3 characteristics include at least first and second types of soft  
4 magnetic pigments capable of holding first and second  
5 predetermined levels of magnetism.

1           24. The magnetic security device of claim 20, wherein said  
2 magnetic regions are formed as graphic indicia on said carrier  
3 substrate.

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1        25. A metallic security device for use with an item, said  
2 metallic security device comprising:

3        a carrier substrate; and

4        a plurality of conductive regions disposed on said carrier  
5 substrate, wherein said conductive regions are separated by non-  
6 conductive regions and have at least two different predetermined  
7 lengths forming a predetermined pattern for representing encoded  
8 data, and wherein said predetermined lengths of said conductive  
9 regions are detectable to read said predetermined pattern and  
10 decode said data.

1        26. The metallic security device of claim 25, wherein said  
2 conductive regions include first and second predetermined lengths  
3 representing binary integers, and wherein said predetermined  
4 pattern of said first and second lengths of said conductive  
5 regions encodes said data in a binary coded format.

1        27. The metallic security device of claim 25, wherein said  
2 conductive regions are formed as graphic indicia and said non-  
3 conductive regions are formed as breaks between said graphic  
4 indicia.

1        28. The metallic security device of claim 25, wherein said  
2 non-conductive regions are formed as graphic indicia and said  
3 conductive regions are formed around said graphic indicia.





1           35. A method of making a magnetic/metallic security device  
2 having a plurality of security features, said method comprising:  
3           providing a carrier substrate having first and second  
4 surfaces;  
5           applying a metallic layer to at least a portion of said  
6 first surface of said carrier substrate;  
7           applying a magnetic chemical resist to at least a portion of  
8 said metallic layer, wherein said magnetic chemical resist forms  
9 a pattern on said metallic layer; and  
10           chemically etching said metallic layer to remove exposed  
11 portions of said metallic layer, wherein chemical etching is  
12 resisted by said magnetic chemical resist such that said magnetic  
13 chemical resist and a portion of said metallic layer underlying  
14 said magnetic chemical resist together form said pattern on said  
15 carrier substrate.

1           36. The method of claim 35, wherein said magnetic chemical  
2 resist includes a film-forming chemical resisting resin  
3 containing magnetic pigments.

1           37. The method of claim 36, wherein said film-forming  
2 chemical resisting resin includes a resin selected from the group  
3 consisting of solvent based resins, water based resins, solid  
4 based resins, ultra violet polymerized resins, and electron beam  
5 polymerized resins.



1 41. A method of authenticating a magnetic/metallic security  
2 device comprising the steps of:  
3 writing data to a magnetic layer disposed on at least a  
4 portion of a carrier substrate;  
5 reading magnetic data from said magnetic layer; and  
6 comparing said read magnetic data with expected magnetic  
7 data.

1 42. The method of claim 41 wherein said expected magnetic  
2 data includes predetermined magnetic data.

1 43. The method of claim 42 wherein said predetermined  
2 magnetic data includes analog data.

1 44. The method of claim 42 wherein said predetermined  
2 magnetic data includes digital data.

1 45. The method of claim 41 wherein said magnetic data  
2 includes a magnetic level.

1 46. The method of claim 45 wherein said magnetic level is  
2 selected from the group consisting of a high magnetic level, a  
3 low magnetic level and a medium magnetic level.





ABSTRACT

A security device having multiple security features is used with an item, such as a secure document, ticket, label or tag, to authenticate the item and/or encode data pertaining to the item. One example of the security device includes a carrier substrate, a metallic layer disposed on the carrier substrate, and a magnetic layer disposed on the metallic layer in substantial registration with at least a portion of the metallic layer, thereby providing both metallic security features and magnetic security features. The metallic layer and the magnetic layer also form graphic or visually identifiable indicia on the carrier substrate to provide a visual security feature. According to one method, the metallic layer is applied to the carrier substrate, the magnetic layer is applied to the metallic layer, and the layers are etched to form the graphic indicia. The magnetic layer can, in one embodiment, include a magnetic chemical resist that is printed on the metallic layer in the form of the graphic indicia. The magnetic security features use one or more magnetic characteristics, such as the level of magnetism and decay rate characteristic of soft magnetism, to authenticate and/or to encode data. The magnetic security feature may also include magnetic tracks for recording data. The metallic security features use different lengths of conductive regions to authenticate and/or encode data.

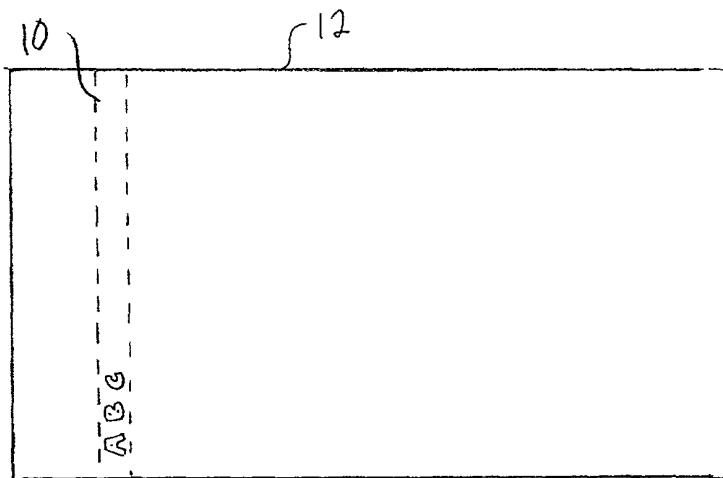


FIG. 1

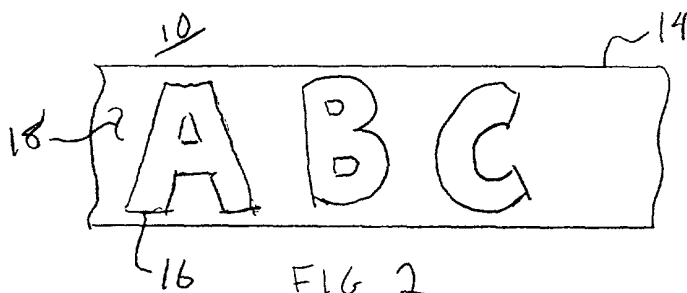


FIG. 2

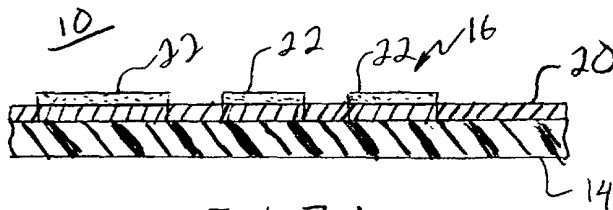


FIG. 3A

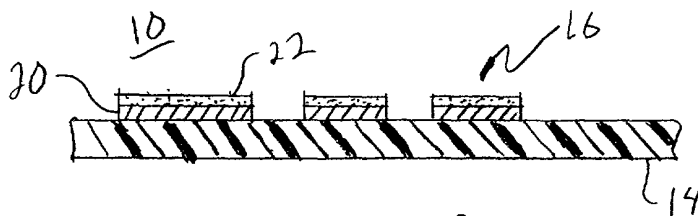


FIG. 3B

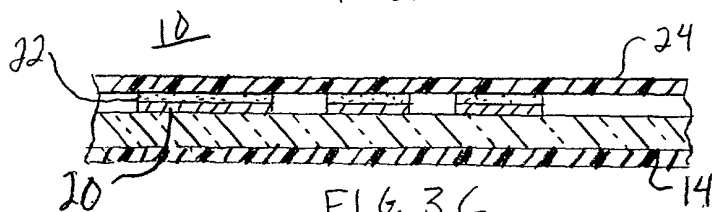


FIG. 3C

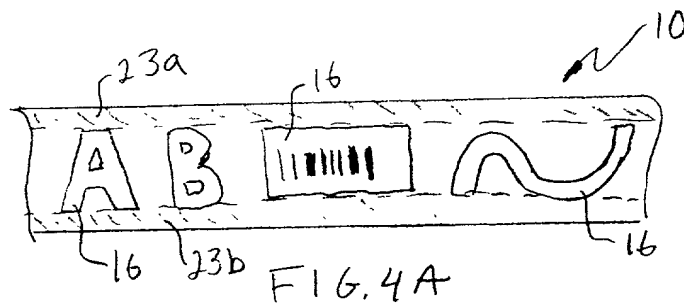


FIG. 4A

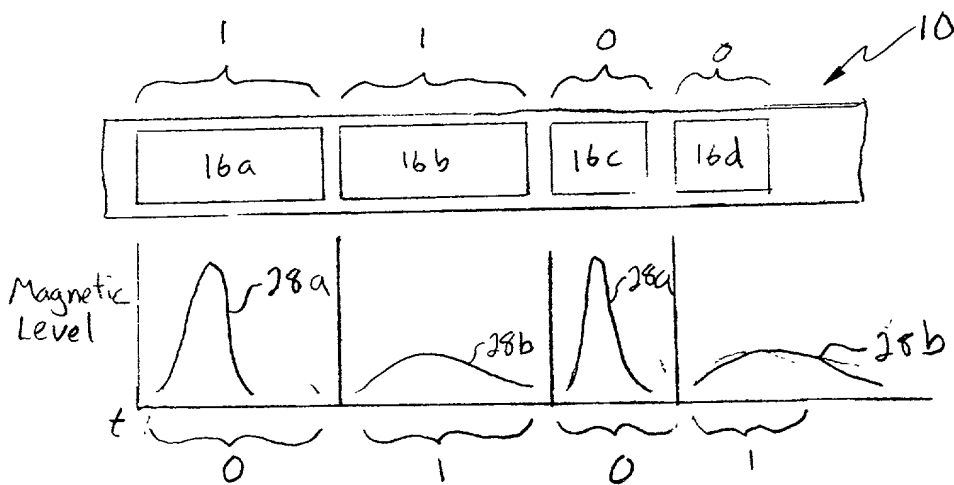


FIG. 4B

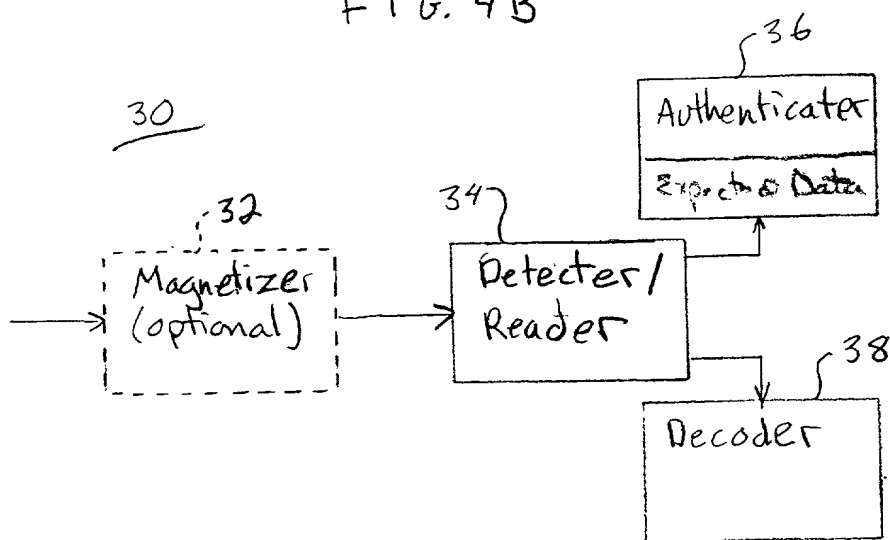


FIG. 5

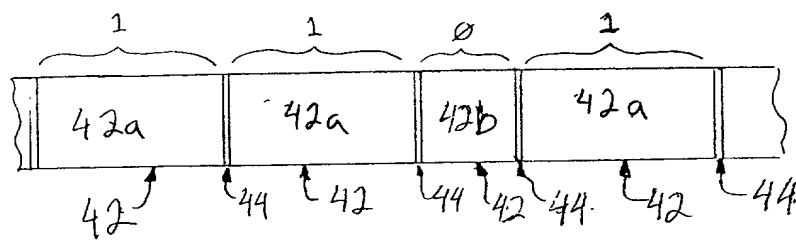


Fig. 6 4.0

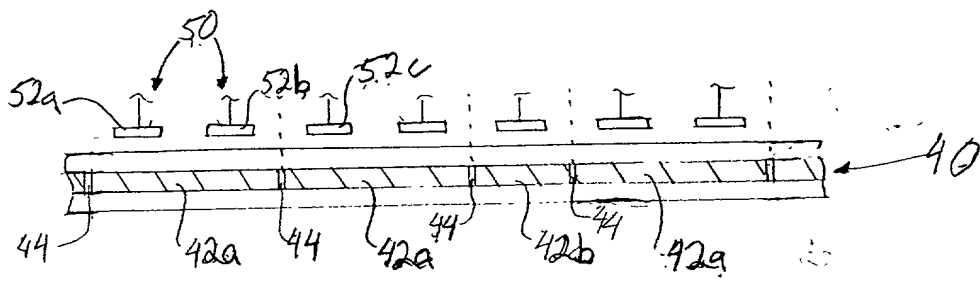
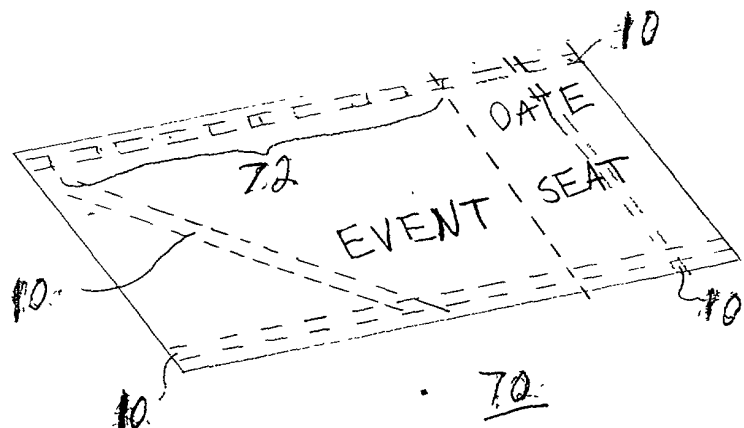
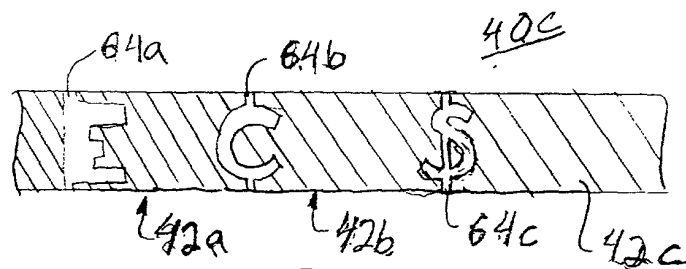
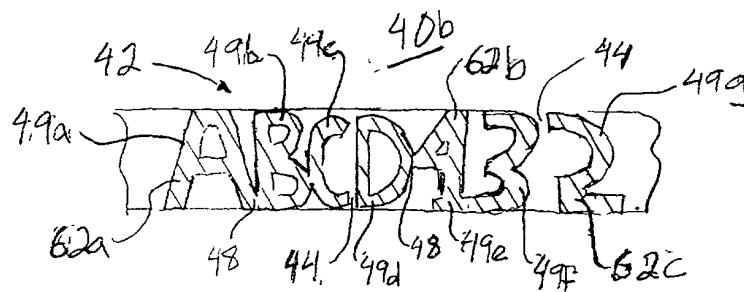
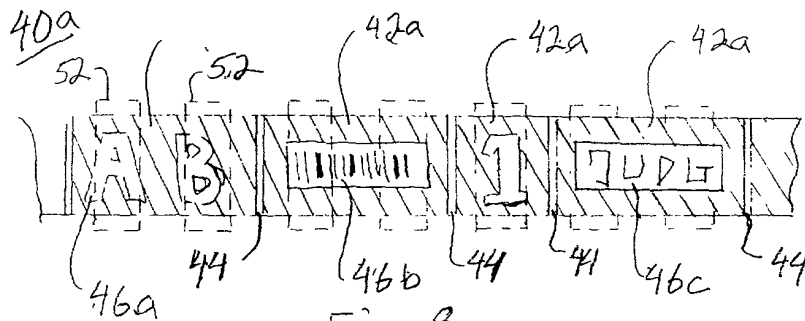


Fig. 7



DECLARATION AND POWER OF ATTORNEY

As a below-named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name;

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

SECURITY DEVICE HAVING MULTIPLE SECURITY FEATURES AND METHOD OF MAKING SAME

the specification of which (check one):

☒ is attached hereto. ☐ was filed \_\_\_\_\_ as Serial No. \_\_\_\_\_;  
amended on \_\_\_\_\_ (if  
applicable).

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations §1.56(a).

I hereby claim foreign priority benefits under Title 35 USC 119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

<u>Prior Foreign Application(s)</u>		<u>Date Filed</u>	<u>Priority Claimed</u>
(Number) [ ] [ ]	(Country) [ ] [ ]	(Day/Month/Year)	Yes No
(Number)	(Country)	(Day/Month/Year)	Yes No

I hereby claim the benefit under Title 35 USC 120 of any United States application(s) listed below and insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35 USC 112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, §1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

(Application Serial No.)	(Filing Date)	(Patented/pending/abandoned)
(Application Serial No.)	(Filing Date)	(Patented/pending/abandoned)

I hereby claim the benefit under Title 35 USC 119(e) of any United States provisional application(s) listed below:

(Application Serial No.)	(Filing Date)	(Patented/pending/abandoned)
60/067,228	12/2/97	pending

**POWER OF ATTORNEY:** As a named inventor, I hereby appoint the following attorney(s) to prosecute this application and transact all business connected therewith in the Patent and Trademark Office, and to file with the USRO any International Application based thereon.

Daniel J. Bourque, 35,457  
Kevin J. Carroll, 36,384  
James T. Sullivan, 36,288

Address all correspondence to:

Bourque & Associates, P.A.  
835 Hanover Street, Suite 303  
Manchester, NH 03104  
Telephone: (603) 623-5111  
Facsimile: (603) 624-1432

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Full Name of Sole/First Inventor: Gary R. Wolpert		
City of Residence Mason	State or Country NH	Country of Citizenship US
Post Office Address 948 Valley Road	City Mason	State or Country    Zip Code NH                    03048
Signature: (Please sign and date in permanent ink.)  X		Date signed:  X



Full Name of Second Joint Inventor:			
Gerald J. Gartner			
City of Residence Hollis	State or Country NH	Country of Citizenship US	
Post Office Address 134 Dow Road	City Hollis	State or Country NH	Zip Code 03049
Signature: (Please sign and date in permanent ink.)  X		Date signed:  X	

Full Name of Third Joint Inventor:			
Stephen B. Curdo			
City of Residence Hollis	State or Country NH	Country of Citizenship US	
Post Office Address 9 Hickory Lane	City Hollis	State or Country NH	Zip Code 03049
Signature: (Please sign and date in permanent ink.)  X		Date signed:  X	

Full Name of Fourth Joint Inventor:			
Paul F. Cote			
City of Residence Hollis	State or Country NH	Country of Citizenship US	
Post Office Address 69 Pepperell Road	City Hollis	State or Country NH	Zip Code 03049
Signature: (Please sign and date in permanent ink.)  X		Date signed:  X	